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(54) STEAM CLEANING METHOD AND APPARATUS

(71) We, HANS MUNTZ, a Dutch National, of 13 McClemans Road, Mt. Claremont, Western Australia, and DOROTHY IRENE BREWSTER, an Australian national, 5 of 103 Woniora Road, Hurstville, New South Wales, Commonwealth of Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to 10 be particularly described in and by the following statement:—

This invention relates to steam cleaning method and apparatus of the type in which the combustion of fuel within a chamber is employed to heat a mixture of water and detergent sufficiently to produce a continuous stream of detergent-containing steam. Such apparatus is described in United Kingdom Patent Specification 773,048, and the present 15 invention is directed to an improvement in apparatus of the general type described in that specification.

The abovementioned United Kingdom Patent Specification describes apparatus 20 which consists of a combustion chamber into which a mixture of fuel and air is burnt after ignition by a spark plug, this combustion chamber being surrounded by a jacket into which is fed a mixture of water and detergent, or some other cleaning liquid. The 25 combustion chamber and the cleaning fluid jacket share a common outlet pipe from which there flows a mixture of the hot combustion products and vaporized cleaning 30 liquid.

This apparatus provides an efficient and effective cleaning device, but suffers from 35 some disadvantages. Since the detergent or other cleaning fluid is mixed with the water prior to the introduction of the cleaning 40 fluid into the apparatus, it is difficult to control during a cleaning operation the concentration or rate of application of the cleaning fluid. Yet such control is desirable, to enable greater amounts of cleaning fluid to be 45 applied to particularly dirty or greasy areas,

and to reduce the quantity in cleaner areas, thereby optimizing cleaning fluid consumption. It is also desirable to be able to rinse the work with steam only to remove detergent at the end of a cleaning operation. 50

Furthermore, since the cleaning fluid is fed with the steam-producing water to the flame produced in the combustion chamber, the use of combustible cleaning fluids, such as kerosene or degreasing oil, is precluded. 55

In accordance with the present invention, these disadvantages are overcome by adding the cleaning fluid to the hot exhaust flow downstream of the point of addition of the steam to the combustion gases. 60

According to the present invention, there is provided apparatus for steam cleaning comprising a combustion chamber having an inlet passage for a combustible fluid and an exit passage for exhaust gases, said combustion chamber co-operating in heat exchange relationship with a second chamber having an inlet port for the admission of water and an outlet port for steam, said outlet port and exit passage communicating at a mixing region with a fluid conduit, and means for admitting a cleaning fluid to said fluid conduit downstream of said mixing region. 65

The invention will now be described by way of example with reference to the figure of the accompanying drawing, which shows a diagrammatic sectional side view of a steam cleaning device according to one embodiment of the invention. 70

A substantially cylindrical, elongated combustion chamber (1) is supplied with air through a pipeline (2) and control valve (3). Fuel such as petrol is admitted to the air-stream in a controlled quantity by a needle valve (4) and the combined combustible mixture enters the combustion chamber at an inlet port (5). The combustible mixture is ignited by a spark plug (6) supplied with current by any convenient magneto or trembler-coil circuit. After moving through 75

- the combustible chamber (1), the exhaust gases pass out through an exit passage (7) which may take the form of a convergent-divergent nozzle configuration. At the same time, mains pressure water is admitted via control valve (8) and inlet port (9) to a second chamber (10) which surrounds the combustion chamber (1). As the water moves along said second chamber (10), it is pre-heated through contact with the outer surface of the combustion chamber (1). A pre-heated mixture of water and steam finally leaves the second chamber (10) through an outlet port (11) located adjacent to the combustion chamber exit passage (7) to combine with the exhaust combustion gases as these emerge from the combustion chamber (1). The combined mixture of steam, very hot water and combustion gases is at a temperature of about 105°C to 120°C as it passes through a fluid conduit (12) to an exit nozzle (13).
- Detergent or other cleaning fluid such as kerosene or degreasing oil is fed through a manually operable valve (14) to the fluid conduit (12) at a point (15) approximately mid-way of its length. Here it is introduced into the hot stream of water, steam and combustion gases to form the cleaning jet which issues from the exit nozzle (13).
- The apparatus thus far described takes the form of a hand-held device, supplied by fuel/air, water, and detergent hoses from pressure storage equipment which provides tanks for the storage of petrol and detergent, and compressed air distribution devices, together with an air-operated magneto or other ignition equipment.
- The apparatus described has the further advantage that by appropriate control of the fuel and water, wet or dry steam may be produced as required.
- WHAT WE CLAIM IS:—**
1. Apparatus for steam cleaning comprising a combustion chamber having an inlet passage for a combustible fluid and an exit passage for exhaust gases, said combustion chamber co-operating in heat exchange relationship with a second chamber having an inlet port for the admission of water and an outlet port for steam, said outlet port and exit passage communicating at a mixing region with a fluid conduit, and means for admitting a cleaning fluid to said fluid conduit downstream of said mixing region.
 2. Apparatus as claimed in claim 1 wherein said second chamber is disposed substantially around said combustion chamber.
 3. Apparatus as claimed in claim 2 wherein said exit passage includes a convergent-divergent nozzle.
 4. Apparatus as claimed in claim 3 wherein said outlet port is located adjacent the throat of said convergent-divergent nozzle.
 5. Apparatus according to any of the preceding claims wherein said cleaning fluid is admitted to said fluid conduit at a location approximately midway between said mixing region and an exit nozzle at the remote end of said fluid conduit.
 6. A method of steam cleaning whereby a cleaning fluid is mixed with a hot exhaust flow of steam and combustion gases downstream of the point of addition of the steam to the combustion gases.
 7. Apparatus for steam cleaning substantially as herein described with reference to the figure of the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

